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ABSTRACT

This study investigates the effectiveness of the U.S. Forest Service's "Wilderness and Land Ethic" curriculum. Students and teachers from three states--Colorado, Minnesota, and Montana--participated in the study. Comparisons were made between grade level, state, and gender to determine any differences. Results indicate that school-based wilderness education curricula can be effective in educating the wilderness visitor on appropriate wilderness behavior. (YDS)

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# An Evaluative Study of the K-8 "Wilderness & Land Ethic" Curriculum

## Study Rationale

Many scientists and managers consider education the key to solving recreational use problems in Wilderness. They believe education to be the most effective light-handed management strategy to reduce impacts and conflict in Wilderness, while retaining visitors' freedom of choice. Yet little is known about the effectiveness of existing educational programs in changing knowledge, attitudes and beliefs. Despite the diversity of Wilderness information and education techniques, there has been little research on the design, application, and effectiveness of Wilderness education programs. Educating the public has long been considered an important function of land stewardship. In the past, this has largely meant training Wilderness visitors in low-impact camping techniques and user ethics. However, Wilderness education needs to expand by instructing visitors on how to build a shared understanding of the role and value of Wilderness to society. During the past decade Wilderness managers have increasingly turned to school-based programs as a Wilderness education technique (Hendricks, 1999). These programs may be effective in managing the behavior of current and future Wilderness users, but little is known about their effectiveness. Wilderness education programs have not been tested for their effectiveness in changing levels of knowledge about desired behavior, or changing behavior.

## Purpose of the Study

The purpose of this study is to determine the effectiveness of the U.S. Forest Service "Wilderness & Land Ethic" curriculum to influence students' knowledge, attitudes, and beliefs about Wilderness. The specific Wilderness education format evaluated in this study is the "Wilderness & Land Ethic" curriculum and teacher workshops.

The following are the study's research objectives:

1. Identify the major theoretical models and research results that relate to the processes of using education to influence knowledge, attitudes, and beliefs about Wilderness.
2. Apply the theoretical models to goals and current methods of Wilderness education to determine the level that theoretical foundations influence current Wilderness education efforts.
3. Evaluate the "Wilderness & Land Ethic" curriculum to measure its effectiveness in influencing knowledge, attitudes, and beliefs of students concerning Wilderness.

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4. Collect and analyze the opinions of teachers who have used the "Wilderness & Land Ethic" curriculum to develop recommendations on how the curriculum can be improved.
5. Make recommendations on how Wilderness curricula and teacher workshops can effectively influence knowledge, attitudes, and beliefs about Wilderness.

Research Questions

This study addresses the following research questions:

1. How does the "Wilderness and Land Ethic" curriculum influence students' knowledge, attitudes, and beliefs about Wilderness?
2. How can the "Wilderness and Land Ethic" curriculum and teacher workshops be improved to better address knowledge, attitudes, and beliefs about Wilderness?
3. Applying the Model of Responsible Environmental Behavior, what conclusions can be drawn regarding the influence of the "Wilderness & Land Ethic" curriculum on knowledge, attitudes, and beliefs about Wilderness?

**Literature**

The literature on Wilderness education, environmental education, and evaluation of related curriculum was reviewed. The literature review included several learning theories pertaining to cognition and behavior, social psychology theories of persuasion, and a discussion of the behavioral model of responsible environmental behavior as a theoretical foundation for this study.

Theoretical Foundations

This current study uses the model of responsible environmental behavior (Hines, Hungerford, & Tomera, 1986/1987; Hungerford & Volk, 1990) as the primary theoretical foundation of the research, and applied the model, and its variables, to the process of Wilderness education. Since the goal of environmental education is the development of environmentally responsible and active citizens (Stapp,1969), seven variables identified in the responsible environmental behavior model were tested, using the "Wilderness and Land Ethic" curriculum as an evaluative study, to determine if the curriculum influences students' knowledge, attitudes, and beliefs about Wilderness, and if the model can be used to better understand the influence the curriculum has on participants.

**Methodology**

The research design used multiple data collection methods. The evaluation methods include both qualitative and quantitative methodology. Evaluation of the "Wilderness and Land Ethic" curriculum used a mail-back survey of teachers, testing of students and interviews with teachers. One of the lessons in this curriculum focuses on an introduction to Wilderness. Because the introductory lesson incorporates students' knowledge, attitudes, and beliefs about Wilderness, it was a major focus of this curriculum evaluation.

Description of Participants

Participants for this study included both teachers and students. Student participants were school-age children in the fourth and eighth grades who attend selected public schools in Colorado, Minnesota and Montana. Student participants consisted of 670 students in 11 schools. There were 174 fourth graders from 8 elementary schools and 496 seventh grade students from 6 middle schools. These three states were chosen as study sites due to a long history of the Wilderness curriculum use and school proximity to Wilderness areas. Students were selected from four community size areas (rural/small town [less than 2,500 to less than 25,000], large town/mid-size city [greater than 25,000 to less than 400,000], suburban [fringes of mid-size city and large city], and big city [greater than 400,000]) in Colorado, Minnesota and Montana. Fourth graders were chosen to represent an elementary grade level that has received little evaluation in environmental education research. Students in eighth grade represented a sample at the middle school level. Eighth graders have been the subject of considerable research regarding responsible environmental behavior (Ramsey, Hungerford, & Tomera, 1981; Volk & Hungerford, 1981).

The teachers selected for this study have participated in a "Wilderness & Land Ethic" workshop, and have used the curriculum with their students.

Interviews with Teachers on Curriculum Effectiveness

Telephone interviews were conducted with twelve teachers (two from each of six geographic areas of the U.S.) who have participated in a "Wilderness & Land Ethic" workshop and used the curriculum with their students. The focus of these interviews was to arrive at a set of goals and objectives that helped guide the curriculum evaluation process; determine how teachers believe the curriculum influences students' knowledge, attitudes, and beliefs about Wilderness; and, identified the patterns of curriculum use, characteristics of teachers, and factors influencing implementation. The results of the interviews were used to develop a mail-back survey to evaluate the curriculum with an expanded set of educators.

Survey of Teachers' Perceptions about the Effectiveness of the "Wilderness & Land Ethic" Curriculum

Using the results from the telephone interviews, a mail-back survey was developed and administered to a sample of teachers (224) who have used the "Wilderness & Land Ethic" curriculum to determine their perceptions of the effectiveness of the curriculum. The information that emerged from the results helped identify patterns of curriculum use, teacher's perceptions of how the curriculum influences students, factors influencing implementation, and how characteristics of teachers influence the effectiveness of the curriculum. Teachers were asked to give recommendations on how the curriculum can be improved. For ease in responding, the survey used a multiple-choice scale and included some open-ended questions. The return rate was approximately 52%.

Evaluation of Students' Knowledge, Attitudes, and Beliefs about Wilderness

During the 1999/2000 and 2000/2001 school years, a lesson from the "Wilderness & Land Ethic" curriculum was tested with elementary and middle school students. A pre and post-test on the "Introduction to Wilderness" lesson was administered to students in the treatment groups and the control groups to determine knowledge, attitudes, and beliefs based on seven variables found to correlate with and predict responsible environmental behavior (Hines, Hungerford, & Tomera, 1986/1987; Hungerford & Volk, 1990; Marcinkowski, 1989; Marcinkowski, 1998; Sia, 1986; Sivek, 1989). A lesson from the curriculum was taught to students in the treatment groups. Students in the control groups did not participate in the lesson. The tests were designed using adapted questions from existing tests on responsible environmental behavior.

Comparisons were made between treatment and control groups, between grade levels, by state, and gender and to determine differences regarding effectiveness of the curriculum. Comparisons were made between school community sizes.

The Influence of a "Wilderness & Land Ethic" Teacher Workshop on Teachers' Knowledge, Attitudes, & Beliefs about Wilderness and Curriculum Use

An important component of disseminating the "Wilderness & Land Ethic" curriculum are the teacher training workshops. Teacher training workshop sites representing different demographic areas were selected. Individual telephone interviews were conducted with 24 teachers within six months after teachers participated in a training workshop to determine if there was a relationship between workshop attendance and use of the curriculum; determine if teachers are receiving adequate information on best practices for current state and national educational standards; and, develop guidelines for an optimal training workshop model or delivery mechanism to meet curriculum goals and objectives. Comparisons were made between information gathered from teacher surveys and interviews with teachers who attended training workshops.

All instruments were developed with the Aldo Leopold Wilderness Research Institute researchers and recognized experts in environmental education curriculum evaluation to gain their insights and ensure the validity and reliability of the instruments used. Instruments were pilot-tested prior to conducting the research.

**Data Analysis**

A combination of data collection instruments were used to assess the effectiveness of "Wilderness and Land Ethic" curriculum to influence knowledge, attitudes, and beliefs about Wilderness as well as to determine the future direction of Wilderness education methods.

Interviews

All the telephone interviews were transcribed verbatim and analyzed using content analysis methods. Results from the initial interviews were used to develop survey questions. Information gathered from the telephone interviews with teachers after they had attended a teacher workshop were used to develop recommendations for improving the "Wilderness & Land Ethic" curriculum and teacher training workshops.

Surveys and Pre/Post Tests

Responses obtained from teacher surveys and the pre/post student tests produced several types of data. Survey and test results were analyzed using descriptive and inferential statistical methods. The methods included frequency distributions, percentile ranking, means, standard deviations, t-tests, and chi-squares. An analysis of differences of pre/post test scores of students determined if there were significantly higher post test scores; whether there was an increase in students' knowledge, attitudes, and beliefs about Wilderness; and if the data gathered supports the Model of Responsible Environmental Behavior. Mean pre-test and post-test scores of students were calculated for participating classrooms, and the mean scores were used to compute gain scores for each class. Gain scores between the pre/post tests were analyzed using analysis of variance (ANOVA). According to Fleming (1983), this level of data collection is recommended for situations where teachers are distributing a new curriculum to students.

**Conclusion**

Student Testing

There were more significant differences from pre to post test scores for students in both grade levels from the treatment groups than from the control groups. The curriculum is more effective with seventh grade students than for fourth grade students and it is more effective for Montana students at both grade levels than for students in Colorado or Minnesota. Community size and gender were not major influences. The most significant increases from pre to post test scores occurred for two variables, "Knowledge about Wilderness" and "Environmental Sensitivity". The lesson from the curriculum resulted in an increase in students' knowledge about naturally occurring fires in Wilderness.

Teacher Survey Results and Telephone Interviews

The analysis of teacher survey results indicated that 80% of the teachers who responded have used the curriculum in their classrooms and tend to use it as individual, supplementary lessons. Teachers who used the curriculum tended (significantly) to use the curriculum to fulfill educational standards (82%) and they would like a cross reference of lesson plans with science, math, and social studies standards.

Those teachers who used the curriculum are teachers who have had more teaching experience although there was no significant difference in responses according to where they grew up or the size of the school where they teach. Those teachers (80%) who live close to a designated Wilderness (within 100 miles) are more likely to be curriculum users. Teachers want more age-appropriate lessons and more training opportunities.

The analysis of telephone interviews to determine the influence of a training workshop on curriculum use and how the curriculum can be improved produced numerous recommendations. Of the teachers who have used the curriculum, 70% used it to supplement their science program. The greatest strengths of the teacher workshops indicated by participating teachers were 1) the workshop format which allowed

teaching resources made available to them; and, 3) the in-depth knowledge of the instructors. It is also important to offer workshops for academic credit (92%) and renewal credits (88%). Teachers suggested that a Wilderness education course could be made available on the web, using distance learning so teachers in remote areas can learn and integrate the Wilderness curriculum into their existing curriculum. Offering a course for a college term was another recommendation for implementation. And, teachers want more outdoor experiences modeling Leave No Trace camping techniques.

**Recommendations for Wilderness Education**

The results of this study indicate that school based Wilderness education curricula can be effective in educating the Wilderness visitor, and future visitors, on appropriate Wilderness behavior. Wilderness education studies which evaluated responsible environmental behavior variables report increases in knowledge and short-term behavioral gains, but no long-term behavior changes. There is a need to conduct longitudinal studies in several grade levels to determine effectiveness of the "Wilderness & Land Ethic" curriculum to influence Wilderness behavior and provide effective approaches to educate students on appropriate Wilderness behavior.

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